# Kangaroo Rats.

## Observations on the Kansas species of Perodipus.

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During the fall of 1904 it became my task to travel to the town of Kinsley, Edwards Co. Kansas, in order to investigate the depredations of the kangaroo rats (Perodipus richardsoni) in the sand hills near the place. In the investigations which followed, a number of interesting facts were secured, which, added to some previous knowledge of the animal, gained largely through a trip or two in the western part of the state, in the interests of the college entomological museum, and to much information on the subject by Prof.D.E.Lantz, then Field agent for the Experiment Station of the Kansas State Agricultural College,gave me an impulse toward the following subject.

The kangaroo rats are members of the sixth family of the Rodentia, the Heteromyidae. This family is most nearly related to the Geomyidae, or pocket gophers,on the one hand, and to the Zapodidae, or jumping mice, on the other. They are characterized outwardly by the possession of fur lined, outwardly opening,cheek pouches extending back to the shoulders,and by long hind legs and feet, adapted for jumping. The characteristic features of the skull and dentition are,rootless molars, narrow incisors, mastoids enormously developed and appearing on top of the skull, tympanic bones greatly inflated and possessing a nontubular meatal orifice.

The Heteromyidae are divided into two subfamilies, the Dipodomyinae and the Heteromyinae. The Heteromyinae includes the pocket mice of the genera Perognathus and Heteromys, having shorter hind legs, feet with naked soles, and less fully developed tympanic bones. The mice of this group,or the pocket mice,are less developed for jumping, as the hind legs are not so strong,the tails are shorter and the bodies heavier than in the next group.

In this subfamily, however, the jumping habit does not necessitate extreme bulk or massive development of the hind quarters. Instead, the limbs are light and graceful,being broadened and flattened at the thighs rather more than usual, but not more than is consistent with grace and the possession of very light and slender feet.

The Dipodomyidae, or kangaroo rats proper,are the most beautiful rats known, and also deserve a place among the most beautiful mammals. They are exceedingly graceful and active as they hop lightly about on their long hind feet. They are able to cover a considerable distance at a bound,often jumping three or four feet or more. The ordinary mode of progression is a series of short jumps in which the fore feet are used in much the same manner as those of the hare. The tail is used to change the direction of the flight,while in the air,and to balance the animal in its long jumps.

This subfamily contains three genera,Dipodomys,Perodipus and Microdipodops. These genera are characterized by the long hind legs, the long penicellate tail and the enormous mastoid and tympanic developement. They are all very much alike in color,being all pale or dark ochraceous buff streaked with black,having white spots over the eyes and behind the ears, and white underparts and stripe on thighs. They are residents,chiefly, of the western United States, inhabiting sandy or clayey banks and flats, and a large part of the plains area. They live in burrows in the ground,usually far from water. The members of the genus Dipodomys are the largest of the group, Perodipus being next, and Microdipodops being smallest, as the name would suggest. Of Microdipodops,we have but one species, a resident of the plains region of Nevada. The five species of Dipodomys are nearly all Californian, two species,desertorum and

elator,extending into western Texas and even into Oklahoma.
The species of Perodipus are by far the most numerous, as there are at present nine species known to science.Of these the greater number are found in the western and Sonoran regions of California,Arizona and Texas. Two species exist in Kansas. In the northwestern part of the state and extending as far east as Riley County in the western part, Perodipus ordi probably occurs, while in the sandy flats of the Arkansas river and in the sandhills along the Arkansas valley, and also,probably in the sandhills along the Cimmaron river, Perodipus richardsoni is extremely plentiful. It is very likely that a third species, Perodipus longipes may exist in the extreme northwest or in Cheyenne County but its presence there has not as yet been determined. Perodipus ordi is the smaller of the two species, and as far as I have observed, seems to prefer the clay bluffs along rivers or the washed sides of hills, for its habitations. The larger species Perodipus richardsoni,as far as observed,prefers sandy soil, and may be found plentifully in the sandhills of southwestern Kansas, where they are known as"sand rats".

The members of the genus Perodipus possess nasal bones produced considerably beyond the incisors,which feature places the mouth rather under the head. The nose is pointed, the eyes large and expressive and the ears well developed. The neck is of medium length and well marked,the forepaws are quite small and well adapted for holding the food, and the hind feet are long and slender,with thickened and widened thighs and furry soles. The members of this genus possess on the hind foot,a rudimentary fifth toe bearing a claw, in distinction to Dipodomys,which has but four toes on the hind foot.

The tail is long, usually longer than the combined length of the head and body, and is furnished with a soft brush of long hairs at the end. In P. ordi the tail seems to be shorter in proportion to the total length, than in P.richardsoni, where it is one and one quarter to one and one half times the length of the head and body. The fur is very soft and fine, of an ochraceous buff in color on the back and upper parts, paler on the sides, with large white marks over the eyes, behind the ears, and diagonally across the thighs. The underside of the body and the inside of the front and hind feet is white, as is also the tail, with the exception of the brush, a dark stripe running the length of the tail above, and a plumbeous or sooty stripe running over half the length of the tail below.

The homes of P.ordi seem to be mainly the holes which they dig in the clay banks. These burrows frequently have several entrances and the galleries are carried far inside.

Perodipus richardsoni honeycombs the ground all over with the holes and runways. The main homes are immense mounds of sand, frequently one or two feet high and thirty to forty feet across. The section of a hill shows that the burrows extend about one or two feet under ground, the lowest found being about two feet. These hills have a large number of entrances, thirty to fifty being often seen .The ground between these hillocks is thickly undermined to a depth of about one foot. The burrow is hemispherical in section, having a flat bottom and an arched ceiling. The earth from the excavation is forcibly thrown from the burrows to a distance of eighteen inches to two feet. The size of the entrances varies from two to four and five inches across, while the size of the underground passages is about three or four inches. The nests or resting places are made as blind pockets five or six inches in diameter, and are filled with grass and thistle down.

The granaries are similar pockets where the food is stored. These are usually deep in the ground, so that the food may be kept from heating or sprouting and may thus be preserved longer. No nests which could be recognized as brood nests were unearthed.

It is probable that they bring forth more than one litter of young during the year, as in November some specimens not fully grown, were taken, as well as males and females rutting. But little is known as to the number of young produced at a birth but as the mammae of the females number six, and as several young are produced by allied forms, as Perognathus, it is probable that three or four are produced, at least, as the various species form extensively the food of some of the carnivora of this region. The burrows of the badger, seen among the hills of the rats tend to show that the badger at least, makes frequent meals of these animals, and the observations of others on the subject give rise to the belief that they are frequently preyed upon by coyotes and the small foxes of the hills and plains. Thus, the fact that they are able to hold their own, even after the persecutions of these enemies and even to increase under this slaughter, gives rise to the belief that they are quite prolific.

The food of the kangaroo rats, as evidenced by the food stored in their granaries, and examination of the pouches and stomachs of captured specimens, consists of several varieties of seeds and in some cases insects, as evidenced by remains found in the stomachs. The commonest of the wild seeds found in the pouches was that of a small variety of Artemisia, or ragweed, which grew on the sand. The seed of certain wild grasses resembling the seed of foxtail grass was found to some extent, while the seed of sunflower, bullnettle and Russian thistle formed no small part of the contents of the pouches.

Wheat,corn,sorghum and Kaffir corn are welcomed by the rats,which can carry no small amount of the seed in their pouches. 120 seeds of Kaffir corn were found in the pouches of one rat captured with bait of Kaffir corn. The food is placed in the pouches with the aid of the fore paws,which are quite prehensile and well adapted for this use. It is then carried in these pouches to the granaries,only the immediate wants being supplied outside. The insects captured are usually devoured at once. As usual with many rodents,the kangaroo rats are most active at dusk or after dark, when they become rather tame.They are occasionally seen by daylight,outside of their burrows but are easily frightened and quickly scamper back with a bounding run. At Wallace, in Wallace County,Kansas, it is not unusual when walking after dark along the clay bluffs that there form the homes of P.Ordi,to see by the light of a lantern, numbers of the little animals running about on the banks. On setting the lantern down,and remaining still afew minutes in the near neighborhood,the rats are attracted, and skip and play about the lantern in the light,some being so fearless that they are easily captured or killed with a stick or whip. But few specimens of P.richardsoni showed the same habit, however, when tested in the neighborhood of Kinsley. Only one or two were here observed to approach the light,and then did not stop to play about it,but skipped across the lighted patch on their way. However the habit of being largely out on warm,still,moonlight nights seems to be common to both,as the tracks in the sand after such a night will show.

It is stated by some authors that these animals make interesting and amusing pets, and seem to be indefatigable workers, raising large mounds of sand.The burrowing is done with the small hind feet which throw the sand back between the hind feet in a shower.

The kangaroo rats do not attempt to bite or escape when captured, seeming to resign themselves to fate. They are not likely to gnaw out of boxes in which they may be placed, as the teeth are too small and narrow for success in such work. They should make good pets, on account of their beauty and activity, as they are capable of clearing several feet in a bound.

They may be taken in most rat and mouse traps, but care should be used in their capture, as the bones of the legs and head are so brittle that they are easily broken by the traps. They show some ingenuity in avoiding steel traps, by burrowing around or under them when placed at the entrance of the hole.

The natural enemies of the kangaroo rat are usually but few, coyotes, skunks and badgers among mammals, hawks and owls among birds, and the several species of snakes found in the region, probably including the most important ones. The extent to which the badger makes his food on these mammals is plainly indicated by the number of large holes dug in the sand of the towns. In most cases these are very frequent. It is said that the coyote remains near when the badger burrows after a rat, and when the inhabitants of the burrows rush out, captures them. The coyotes undoubtedly capture many while playing about in the dusk. The various species of snakes also levy toll on the inhabitants of the rat village. The extermination of these natural enemies by settlers, is probably one cause for the increase of the species in southwestern Kansas. Here they have become quite plentiful, so much so that acres of ground are abandoned on account of these animals.

The disadvantage of the presence of the rats comes in seeding time, when nearly all the seed may be stolen from the ground after planting.

It is stated by residents at Kinsley,that the rats will destroy corn and wheat up to three or four inches high. The fields near the town show sufficiently well the effects of their occupation by the rats as in many of them the wheat and corn planted shows,on ripening, plants from ten to fifteen feet apart on the wheat lands and frequent fields which are almost entirely bare, the rats having taken the entire planting. They also gather quantities of the grain after ripening, and store in their granaries, but the stealing of the planted grain and the burrowing in the ground are the chief crimes charged against them. These burrows are in many places so thick that walking is made extremely difficult in the infested fields, horses and pedestrians sinking into the ground five or six inches deep.

The good which may be placed on the other side of the account consists in the destruction of numbers of weed seeds. The Russian thistle,bullnettles and ragweeds are kept down to a considerable extent by the rats, in infested districts. It is however probable that the good is far outweighed by the bad.

In order to check the depredations of the rats,several methods have been tried. The method of trapping is too slow and the rats soon learn to avoid the traps after they have been in use afew times. Some success has been given to killing the rats while plowing,when they skip out and run before the plow as it breaks into their burrows. This method, however, is practicable only on tilled lands. Poisoning has been so far only a partial success, as the rats do not eat the poisoned grain immediately, but carry it into the granaries and do not consume it until the winter, and sometimes not at all. In fact the natural habits of the animals make it likely that this poisoned food will not be used in a number of cases. However more

success has been given to this method of destruction thn to any others which have been tried. The poison used in the tests has been the standard prairie dog and gopher poison used by the Kansas Experiment Station. In the parts of the fields tested this has proved a partial success, if the results were not taken until the following spring. This was determined by the fact that the hills and burrows seemed to be nearly all unoccupied the following spring,where the tests were made. However, the fact that holes were occupied in the spring denoted either ineffectual destruction or migration from inhabited districts. The latter is probable, as the natural rapidity of reproduction in the species would soon furnish new inhabitants,should the old ones leave. In the badly infested regions, the destruction of all the rats over a large area will be necessary before immunity from their attacks can be insured. In some parts of the country, they are not at present sufficiently numerous or troublesome to cause apprehension or necessitate destruction. However where they are numerous they may become a serious pest, and efforts should be made to keep them in check by poisoning. If this is done frequently,and the numbers not allowed to increase greatly,there should be no trouble experienced in the raising of crops on infested land. It is the removal of the natural checks which allows the rapid increase of the species,and if artificial checks are applied,the rats should be easily kept down. It is worth while to try the methods at least, and learn the best methods for their check. It may be,that later a more effectual method of extermination than poisoning may be found, but as yet we must depend on poison.

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